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Supporting Efficiency in Health Care at the Community Level

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Abstract

Health care providers and payers in the United States have worked to provide care at reasonable costs. This has frequently been a challenge. For example, the COVID epidemic has generated large expenditures with limited efforts to contain costs. Based on the experiences of providers in Syracuse, New York, this study suggested that realistic approaches are necessary to improve health care efficiency. It described three programs that have improved utilization at the community level. They have included the diversion of large numbers of ambulances that directed patients to emergency departments where care was most available. They have also involved length of stay reduction that saved thousands of patient days and made additional inpatient care available in hospitals. They have also included the use of ambulatory surgery to reduce the need for inpatient care. The data from these programs demonstrated that efforts to improve the efficiency of care can reduce inpatient utilization and improve outcomes. The Syracuse hospitals have used them to make additional capacity available for COVID patients and other populations.

Keywords

Hospitals, Ambulance Diversion, Hospital Lengths of Stay, Ambulatory Surgery

1. Introduction

In the United States, the health care system has been a major part of society for more than fifty years. The need for health care has been closely connected to the quality of life of populations. The system has also been one of the largest businesses in the nation [1] [2].

The Coronavirus epidemic has probably strengthened the connection between health care and the quality of life. The utilization of hospitals, physicians, and

other providers of care has increased. The awareness of symptoms and the use of preventive measures such as masks have become widespread. The consciousness of the importance of the health care system has been reflected in daily media reports [1] [3].

Amid this level of interest, attention to health care costs and efficiency has been somewhat lacking. Large amounts of money have been justifiably spent on Coronavirus vaccines. Billions of dollars have been devoted to the provision of care in hospitals and other providers, without a large amount of attention to the efficiency of these expenditures [4] [5] [6].

It appears that epidemics and other clinical conditions will continue to challenge health care systems. At the same time, providers will need to improve efficiency and manage the resources needed to address these circumstances. This study included examples of programs that have been employed to meet these challenges at the community level [6] [7].

2. Population

This study reviewed programs that have focused on improving the utilization of health care programs in the metropolitan area of Syracuse, New York. This area includes three large acute care facilities, Crouse Hospital (17,204 inpatient discharges excluding well newborns, 2020), St. Joseph's Hospital Health Center (21,328 discharges, 2020), and Upstate University Hospital (30,988 discharges, 2020) [8].

These hospitals provide a full range of care to an immediate service area with a population of approximately 600,000. They also provide tertiary services to the eleven county Central New York Health Service Area with a population of approximately 1,400,000. The Syracuse hospitals have worked through the Hospital Executive Council to improve the efficiency of care in their service area.

3. Method

This study reviewed three different programs developed to improve the efficiency of care in the service area of the Syracuse hospitals. Information concerning utilization of these services was available. They were implemented at the community level.

Each of the programs was employed by the management of provider services to expedite the utilization of care. These programs were developed prior to the Coronavirus epidemic, however, they have been useful in helping area providers address this challenge.

The initial program has been the use of ambulance diversion to improve access to care by moving incoming patients from hospitals that are at or near inpatient capacity to those where additional capacity is available. This has been accomplished through coordination with ambulance dispatchers. Through this approach, ambulances have been diverted prior to arrival at hospital emergency departments. This approach has influenced inpatient admissions and reduces the

need for inpatient transfers between hospitals.

Ambulance diversion has been used by the Syracuse hospitals since the 1980s. They have employed the EMS system to provide ambulance dispatchers and hospital with continuous information concerning the status of the system. It is operated by the Hospital Executive Council.

The second efficiency program has been the use of length of stay reduction for adult medicine and adult surgery within a number of the individual Syracuse hospitals. This effort has included a variety of approaches to limiting stays by expediting the movement of patients home and to appropriate community services. They have focused on reduction of acute care stays, especially for patients who have needed extended inpatient therapy. Data for the program have been developed and distributed by the Hospital Executive Council.

The third program has been the increased use of ambulatory care services in the community for hospital patients with low severity of illness. These services have been used by hospitals and community physicians, especially orthopedists and other surgeons.

4. Results

The initial program in the study involved the development of efficiency in admitting hospital inpatients by diverting incoming ambulances from hospitals where little or no additional capacity was available to hospitals where additional capacity existed. Relevant data are summarized in **Table 1**.

During the period between December 2020 and May 2021, the Syracuse hospitals experienced difficulties in locating unoccupied adult medicine and adult surgery beds. This resulted from increased occupancy produced by patients with

Table 1. Emergency department utilization, hours on ambulance diversion, Syracuse hospitals, December 2020-May 2021.

	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Total
Hours on Ambulance Diversion							
Crouse Hospital	37	19	32	29	104	53	274
St. Joseph's Hospital Health Center	48	28	5	24	55	62	222
Upstate University Hospital - Downtown Campus	69	187	161	290	345	338	1390
Total	154	234	198	343	504	453	1886
Ambulance Transports Received							
Crouse Hospital	1315	1465	1323	1452	1462	1569	8586
St. Joseph's Hospital Health Center	1826	1981	1807	2006	1934	1923	11,477
Upstate University Hospital - Downtown Campus	1378	1283	1198	1309	1265	1414	7847
Total	4519	4729	4328	4767	4661	4906	27,910

Source: Hospital Executive Council data.

the Coronavirus as well as the need to accommodate patients from previous time periods during the epidemic.

The data in **Table 1** indicated that numbers of hours on ambulance diversion per month ranged from 69 to 345 in Hospital C, compared with 5 - 62 hours per month in Hospital B and 19 - 104 hours per month in Hospital A between December 2020 and May 2021. These data reflected the much larger numbers of hours when the emergency department in Hospital C was at or near capacity, compared with those in Hospital A and Hospital B. The data demonstrated that Hospitals A and B also generated hours on ambulance diversion, but at much lower levels than Hospital C.

As a result of the use of ambulance diversion, the Syracuse hospitals also experienced differences in numbers of ambulances received during the period of the study. In Hospital C that was at or near capacity, the monthly number of ambulances received ranged from 1198 to 1414. In Hospital B, the monthly volume ranged from 1807 to 2006 and in Hospital A, the monthly volume ranged from 1315 to 1569. The higher numbers of ambulances received at Hospitals B and A reflected the diversion of patients from Hospital C.

These data demonstrated how the use of ambulance diversion improved the system wide efficiency of the Syracuse hospitals with respect to incoming ambulances. Incoming patients were diverted from a provider where care was less available to hospitals where additional capacity existed. These data also made it possible for Hospital C, which had the largest Coronavirus population, to devote more resources to this population. Some of the additional capacity to serve this group was produced by the use of resources at the other hospitals.

The second efficiency program involved the use of length of stay reduction to improve efficiency by developing additional inpatient adult medicine capacity in the Syracuse hospitals. Relevant data are summarized in **Table 2**.

This information identified adult medicine lengths of stay in each of the Syracuse hospitals compared with severity adjusted national average for October 2019-March 2021. For each hospital, the data included the actual stays, differences between the hospital stays and the national average stays in patient days, and the differences in the average daily censuses.

The lengths of stay and related data suggested the impact of length of stay reduction among the Syracuse hospitals during the three month period. Compared with the severity adjusted national averages in Hospital A, the differences in stays generated reductions of 24.68 - 305.65 days per month for the six month period. In Hospital B, the stays produced savings of 448.15 - 1314.87 days per month. In Hospital C, the differences in patient days saved were 204.60 - 583.95 days per month.

The data demonstrated that substantial numbers of patient days were saved through length of stay reduction at two of the hospitals. These patient days saved amounted to reductions in the need for hospital resources such as nursing staff time, pharmaceuticals, and testing. These savings resulted in the need for 23.45

Table 2. Inpatient adult medicine mean lengths of stay and patient days difference from severity adjusted national average, Syracuse hospitals, October 2020-March 2021.

	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21
Mean Lengths of Stay (Days)						
Crouse Hospital	5.36	5.67	6.20	6.68	5.74	5.92
St. Joseph's Hospital Health Center	4.12	5.66	5.21	6.22	5.20	4.84
Upstate University Hospital - SUNY UMU	5.51	5.81	6.07	6.05	5.82	5.47
Total	5.04	5.73	5.85	6.26	5.61	5.39
Patient Days Difference from Severity Adjusted National Average						
Crouse Hospital	-113.73	-305.65	225.48	478.66	-24.68	90.45
St. Joseph's Hospital Health Center	-1314.87	-1024.79	-730.19	155.40	-448.15	-726.87
Upstate University Hospital - SUNY UMU	-204.60	-239.37	-583.95	-235.59	-318.90	-395.06
Total	-1638.43	-1578.51	-1085.56	392.51	-793.63	-791.63
Average Daily Census Difference						
Crouse Hospital	-3.67	-10.19	7.27	15.44	-0.88	2.92
St. Joseph's Hospital Health Center	-42.42	-34.16	-23.55	5.01	-16.01	-23.45
Upstate University Hospital - SUNY UMU	-6.60	-7.98	-18.84	-7.60	-11.39	-12.74
Total	-52.85	-52.62	-35.02	12.66	-28.34	-25.54

Source: Hospital Executive Council.

fewer inpatient beds at Hospital B and 12.74 fewer beds at Hospital C. The additional beds available at Hospital B amounted to a full nursing unit.

The third component of the study focused on the development of efficiency in the Syracuse hospitals through the substitution of ambulatory surgery for inpatient orthopedic surgery in the Syracuse hospitals. Relevant data are summarized in **Table 3**.

This information identified numbers of hip and knee joint replacements between July 2018-March 2019 and July 2020-March 21 in the combined hospitals. The data were categorized by severity of illness. During this period, additional ambulatory surgery capacity was developed in the community.

The data demonstrated that the number of inpatient hip replacements declined by 569, or 38.4 percent and the number of inpatient knee replacements declined by 908, or 61.5 percent, during the three nine month periods. Almost all of the reductions in inpatient joint replacements involved patients at Minor or Moderate severity of illness.

The study data suggested that the changes in the location of joint procedures during the three year period involved movement from inpatient to outpatient care. This development improved the efficiency of the health care system in Syracuse by reducing the need for inpatient resources and making beds available for other patients.

Table 3. Inpatient hospital discharges, hip & knee joint replacement (APR DRGs 301, 302), by severity of illness, Syracuse hospitals, July 2018-March 2021.

	Severity of Illness				Total
	Minor	Moderate	Major	Extreme	
APR DRG 301 - Hip Joint Replacement					
2018-2019	653	734	72	24	1483
2019-2020	595	732	69	31	1427
2020-2021	348	476	63	27	914
Difference 2018-2020	-305	-258	-9	3	-569
APR DRG 302 - Knee Joint Replacement					
2018-2019	751	662	51	12	1476
2019-2020	696	488	42	8	1234
2020-2021	271	251	38	8	568
Difference 2018-2020	-480	-411	-13	-4	-908

Source: Hospital Executive Council.

5. Discussions

Since the middle of the twentieth century, health care providers and payors in the United States have worked to provide effective care at reasonable costs. This has frequently been a challenge, as demonstrated by rising expenses for health care and the limited success of federal health planning and private approaches such as managed care.

Addressing the COVID epidemic has added to this challenge. It has generated large expenditures to provide care accompanied by limited efforts to constrain costs. This study reviewed a few efforts to improve the efficiency of health care in this context. It focused on efforts at the community level where most health care is delivered.

Based on the experiences of providers in Syracuse, New York, the study suggested realistic approaches are necessary to improve health care efficiency. It described three different programs that have improved utilization at the community level. They have included the diversion of ambulances that has directed patients to emergency departments where care has been most available. They have also involved length of stay reduction to make additional inpatient care available. They have also included the use of ambulatory surgery for low severity of illness patients to limit the need for inpatient care.

The programs described in the study have demonstrated that the development of efficiency involves extensive efforts for the participating providers. Ambulance diversion has involved extensive communication and planning by ambulance dispatchers and emergency medical service staffs. Length of stay reduction has required large amounts of planning by hospital case managers, medical staffs, and long term care providers. The development of ambulatory surgery has included major expansion of this level of care.

The data from these programs demonstrated that efforts to improve efficiency of care can have an important impact on health care utilization and outcomes. Ambulance diversion and length of stay reduction in one of the hospitals made a large amount of capacity available to treat COVID patients in another. Length of stay reduction produced the largest impact by reducing the need for large amounts of inpatient hospital resources. At one of the hospitals, it made a nursing unit and related expenses available for other care needs. These developments occurred at a time when nursing staff were in short supply.

The results generated by the efficiency programs in the health care system of Syracuse suggest that, at a time when health care is involved with much larger issues, saving expenses is well worth the considerable efforts that it requires. The experiences of these programs demonstrate that fewer resources can be a more important objective than more of them.

Conflicts of Interest

The authors declare there are no conflicts of interest regarding the publication of this paper.

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Primary Laryngeal Tuberculosis as a Cause of Persistent Hoarseness—A Case Report

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Abstract

Laryngeal tuberculosis is an uncommon disease of the larynx that can easily be missed. It is however the commonest granulomatous laryngeal pathology. Laryngeal tuberculosis and laryngeal cancer both have similar modes of clinical presentation. We present a case of isolated laryngeal tuberculosis in a 38-year-old Nigerian female, who presented with persistent hoarseness of 3 months duration with no respiratory symptoms and signs. Fiberoptic laryngoscopy showed hyperemia and oedema of the endolarynx, mucoid exudate and thickening of both false and true vocal cords. Tuberculosis was confirmed by gene Xpert. She was placed on rifampicin, isoniazid, pyrazinamide and ethambutol for two months intensive phase and rifampicin and isoniazid for four months continuation phase. There was complete resolution of hoarseness after completion of anti-tuberculous therapy.

Keywords

Laryngeal Tuberculosis, Hoarseness, Gene Xpert, Fiberoptic Laryngoscopy

1. Introduction

Mycobacterium tuberculosis (MTB) is the causative organism of tuberculosis (TB) and is spread when sick individuals with TB expel the bacteria into the air while coughing, talking or laughing. TB typically affects the lungs but the disease can also affect other sites apart from the lungs (extrapulmonary tuberculosis).

Tuberculosis is curable and preventable as most individuals (about 85%) who develop it can be successfully treated with a 6-month drug regimen which has an additional benefit of reducing further transmission of infection [1].

Laryngeal tuberculosis is an uncommon disease and can be easily missed [2]

especially because physical examination findings are usually nonspecific [3]. It is however the commonest granulomatous laryngeal pathology and usually affects males between the 4th and 6th decade of life. Smoking, human immunodeficiency virus (HIV), use of recreational and immunosuppressive drugs and malignancy are factors associated with development of TB in the upper respiratory tract [4].

Laryngeal TB and laryngeal carcinoma both have similar modes of clinical presentation as progressive dysphonia is a symptom which is present in both. Furthermore, they both have similar looking lesions on laryngoscopy [5] [6] [7].

Laryngeal infections usually involve structures of the anterior larynx and are often characterized by hypertrophic, exophytic and/or polypoid lesions. There is affectation of both true and false vocal cords in about 50% - 70% and 40% - 50% respectively. These major structures can cause airway inflammation and obstruction from severe infections which may lead to respiratory distress and respiratory arrest if not properly managed [8].

Laryngeal and pulmonary TB infections usually occur concurrently and laryngeal examinations are not often performed routinely; thus, only pulmonary infections end up being diagnosed thereby, missing concurrent laryngeal TB infections. This indicates that the incidence of laryngeal TB cases is grossly under-reported [9] [10].

The aim of this case report is to present a rare case of primary laryngeal tuberculosis in an environment where pulmonary tuberculosis is very common.

2. Case Presentation

We present a 38 year old woman who presented to the clinic on account of cough and progressive hoarseness of three months duration. Cough was productive of thick, frothy sputum. It was non paroxysmal, not associated with wheezing, chest pain or difficulty in breathing. Cough was worse at night, with no known exacerbating or relieving factors and not associated with fever, chills or rigor. There was no history of hemoptysis. There was weight loss evidenced by loosening of her clothes. Patient had contact with her apprentice who had undergone treatment for TB some time ago (duration could not be ascertained).

There was no history of voice overuse. She takes omeprazole and antacids regularly to control symptoms of peptic ulcer disease (PUD). No previous history of head and neck surgery, she neither smokes cigarette nor takes alcohol. Patient had no history of ear pain or discharge, sore throat, painful or difficulty swallowing, no history of hemoptysis or epistaxis.

At the onset of symptoms, she used over the counter medications (antibiotics and cough syrup) which gave no relief of symptoms, necessitating her presentation to our facility.

On Examination: She was chronically ill looking, not pale, anicteric, afebrile, not cyanosed, not dehydrated, not cyanosed, no pedal edema.

Respiratory rate was 20 cycles per minute and breath sounds were vesicular.

Physical examination of ear, nose and oropharynx were essentially normal.

Chest X ray showed no evidence of pulmonary involvement (**Figure 1**).

Gene Xpert: Positive for *mycobacterium tuberculosis* (MTB) with intermediate RIF resistance index.

HIV: Not reactive

Fibreoptic laryngoscopy: hyperemia and edema of the laryngeal mucosa with thickening of both true and false vocal cords which is worse on the left. There was narrowing of the anterior commissure and incomplete closure of the glottis. Mucoïd exudate was seen in the supraglottic and glottic areas. Both vocal cords were mobile (**Figure 2**).

Patient was commenced on RIPE (Rifampicin, Isoniazid, Pyrazinamide and Ethambutol) regimen which she had for two months (intensive phase).

Rifampicin 150 mg daily

Isoniazid 75 mg daily



Figure 1. Chest x ray with no evidence of pulmonary tuberculosis.

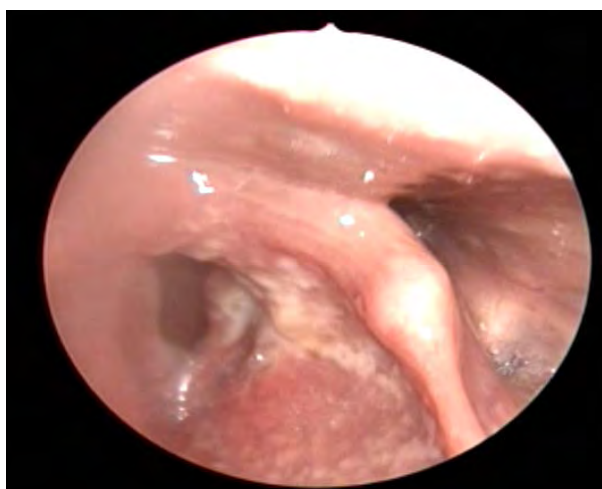


Figure 2. Showing edematous and inflamed vocal cords.

Pyrazinamide 400 mg daily

Ethambutol 275 mg daily

She then proceeded to continuation phase (rifampicin 150 mg and isoniazid 75 mg daily) for four months.

There was no MTB detected by gene Xpert after the completion of continuation phase of anti-tuberculous medication.

Repeat laryngoscopy done after completion of 6 months of anti-tuberculous drugs: essentially normal (**Figure 3**).

3. Discussion

The most prevalent laryngeal granulomatous disease is laryngeal TB [11]. Laryngeal tuberculosis can be divided into two classes: primary (with no pulmonary involvement) or secondary (with pulmonary involvement). Mode of transmission of laryngeal TB is usually by hematogenous, lymphatic or bronchogenic spread from the lungs. In some cases, laryngeal TB may be the primary lesion which indicates that the bacilli were probably inhaled directly and that there are no pulmonary lesions [12].

The commonest presenting complaints in people with laryngeal TB are hoarseness and odynophagia, which occurs in about 80% - 100% of cases [13] [14] [15]. Other complaints present in laryngeal TB patients are dysphagia, dyspnea, stridor, cough and hemoptysis [16]. Laryngeal lesions on laryngoscopy are nonspecific because laryngeal TB lesions may appear similar to that of leukoplakia, reflux laryngitis, laryngeal polyps, contact ulcer and laryngeal cancer [17].

In patients in regions with high TB endemicity presenting with chronic odynophagia, weight loss and hoarseness, a possibility of Laryngeal TB should be entertained so as to prevent delay in diagnosis and treatment. Laryngeal TB may also be misdiagnosed in areas where TB is not endemic as its lesions are non-specific and similar to lesions seen in laryngeal malignancy. Furthermore,

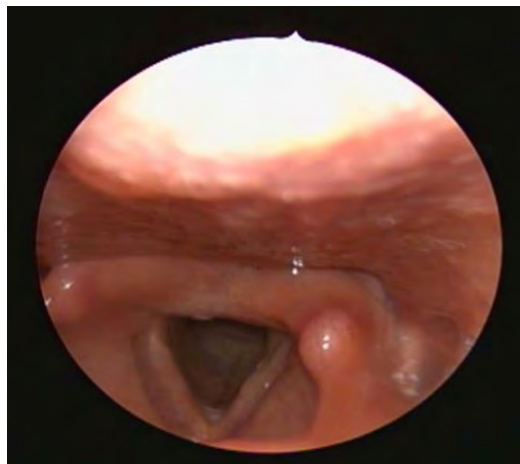


Figure 3. Showing normal findings on repeat laryngoscopy done after completion of anti TB regimen.

laryngeal cancers usually present in older patients. Granulomatosis with polyangiitis, sarcoidosis and syphilis are other granulomatous diseases that may present with lesions involving the larynx [18].

Chest radiography or chest computerized tomography (CT) is the appropriate initial investigation in the evaluation of patients with suspected laryngeal TB with pulmonary involvement. A case series carried out in the United States between 1970 and 2012 on 127 people with laryngeal TB revealed that 86% of those cases recorded radiographic findings suggestive of pulmonary TB [11]. Hoarseness, cough and dysphagia were the commonest presenting complaints of patients in the US study mentioned earlier which is similar to this case presentation as the index patient presented with hoarseness and cough although a chest CT was not done. However, there was no evidence of pulmonary tuberculosis in this patient from her chest x ray.

The World Health Organization (WHO) guideline for treatment of tuberculosis states that patients should undergo six-month regimen (2RHZE/4RH) which means an intensive phase for 2 months consisting of rifampicin (R) and isoniazid (H), pyrazinamide (Z) and ethambutol (E) and a continuation phase for four months of rifampicin (R) and isoniazid (H) [19].

A study carried out in Kenya among five patients with confirmed laryngeal TB showed that after 18 weeks of treatment with anti Kochs, the larynx returned to its normal appearance [20]. This was the case in our patient as fiberoptic laryngoscopy done after completion of 6 months regimen of antituberculous drugs revealed that the laryngeal lesions had disappeared and the larynx was back to normal (Figure 3).

4. Conclusion

Laryngeal tuberculosis should be a differential diagnosis in any patient presenting with hoarseness. Diagnosis requires a high index of suspicion as laryngeal TB presentation is similar to that of laryngeal cancer. Delay in diagnosis poses a significant public health risk to the patient, health workers and the general population.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

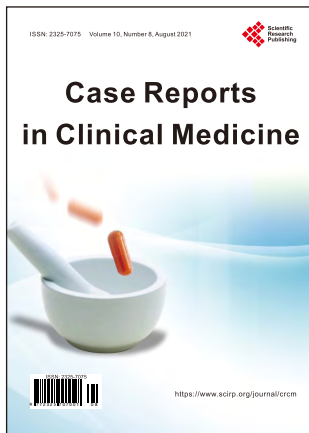
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